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ABSTRACT

Normative data were obtained on the performance of first-year graduate students on the Aptitude Test and Advanced Tests of the Graduate Record Examinations. The population consisted of students enrolled as full-time graduate students for the first time in the fall of 1964 in a college or university belonging to the Council of Graduate Schools (CGS). Subpopulations within each institution were composed of students enrolled in graduate study in 18 major fields--biology, business, chemistry, economics, education, engineering, French, geology, government, history, literature, mathematics, philosophy, physical education, physics, psychology, sociology, and Spanish. Majors in these fields took both the Aptitude Test and the appropriate Advanced Test. Norms are provided for the Verbal and Quantitative sections of the Aptitude Test by major field of study and for performance on the 15 Advanced Tests. Accuracy of the data is discussed and the appendices contain the names of the institutions participating, the plan of data collection, weights used in preparing the frequency distributions, and specific fields classified under particular fields for sampling purposes. (BCV)

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THE GRADUATE RECORD EXAMINATIONS

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GRE

The Performance of First-Year Graduate Students on the Graduate Record Examinations

Gary L. Marco

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GRE

THE PERFORMANCE OF FIRST-YEAR GRADUATE STUDENTS ON THE GRADUATE RECORD EXAMINATIONS

Gary L. Marco

The National Program for Graduate School Selection is under the policy direction of the Graduate Record Examinations Board, an affiliate of the Association of Graduate Schools, the Council of Graduate Schools, and Educational Testing Service.

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PURPOSE AND BACKGROUND

Until the 1967-68 academic year, the primary interpretive materials for the Graduate Record Examinations (GRE) were the scores for basic reference groups of college seniors, who for the most part took the tests in 1952 (1). At its meeting in 1964, the Committee on Testing of the Association of Graduate Schools recommended that new data--data representative of the performance of enrolled first-year graduate students--be collected and published. This recommendation resulted in the initiation of the current study. The purpose of this study was to obtain data on the performance of first-year graduate students on the Aptitude Test and the Advanced Tests of the Graduate Record Examinations.

Today the primary interpretive data for GRE tests are norms for National Program candidates tested from May 1964 through April 1967 (1). However, since not all National Program candidates attend graduate school, the data on first-year graduate students described here should be of further use to graduate schools and fellowship sponsors in interpreting GRE scores.

POPULATION AND SAMPLE

The population of the study consisted of those students who enrolled as full-time graduate students for the first time in the fall of 1964 in a college or university belonging to the 228-member Council of Graduate Schools (CGS). Students from countries where the primary language is not English and students who had physical handicaps (such as blindness) which might have affected their GRE scores were excluded from the population.

Subpopulations were composed of students enrolled in graduate study in 19 major field categories--18 major fields for which GRE Advanced Tests were appropriate and a nineteenth category called "other."

The Advanced Tests for the 18 major fields were as follows:

Biology	Engineering	Literature in English	Physics
Business	French	Mathematics	Psychology
Chemistry	Geology	Philosophy	Sociology
Economics	Government*	Physical Education	Spanish
Education	History		

A two-stage sampling plan was used to select the samples for each of the various subpopulations. The first stage involved the selection of universities and colleges from the CGS members. CGS member institutions were grouped into categories according to the number of graduate degrees awarded in 1961-62 as reported by the U.S. Office of Education (3). The

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*The name of this test will be changed to Political Science in the fall of 1968.

thirty institutions granting the most graduate degrees in 1961-62 were included in the sample. Also included were 15 institutions randomly selected from the 60 universities or colleges with the next highest number of conferred graduate degrees, and 15 randomly selected from the remaining institutions. A greater proportion of the large universities was included in the sample, so that those fields in which only a small number of students were enrolled would be adequately represented.

Of the 60 institutions in the sample invited to participate in the study, 52 agreed to furnish rosters of students and 35 agreed to test each of those students who had not taken the Aptitude Test or an Advanced Test in his major field. Eight schools did not participate. (A list of the participating colleges and universities in each of the three size categories is given in Appendix A.)

The second stage of sampling involved the selection of students within each institution. Some of the participating institutions selected their own samples following a plan suggested by ETS (see the "Plan of Data Collection" in Appendix B), while other institutions sent rosters to ETS for sampling. A spaced sample was chosen according to the ETS plan. The sampling ratios, which varied from field to field, were designed to yield a minimum of 300 students in the group for each of the 19 major field classifications. Thus, smaller percentages of students were sampled from the more popular major fields.

After the second stage of sampling was finished, the 1963 and 1964 ETS files were searched to determine which of the students in the sample had appropriate GRE scores. Each student who attended an institution

that agreed to conduct special testings was asked to take the Aptitude Test if Aptitude scores were missing and the Advanced Test in his major field (provided his undergraduate and graduate major fields were the same) if the Advanced Test score was missing. The special testings were conducted late in the first semester and early in the second semester of the 1964-65 academic year.

PERFORMANCE ON THE GRE TESTS

How well did the first-year graduate students perform on the GRE tests? Score data for Verbal Ability, Quantitative Ability, and the Advanced Tests are given in Tables 1-3. These tables show the percent of graduate students scoring lower than selected scaled scores. It is important to note that, because of missing scores, the Advanced Test distribution for a particular major field was not based on the same students as the Aptitude Test distribution for that field.

The data in Tables 1-3 are based on weighted frequency distributions. Weighting was necessary to estimate the population frequency distributions from the sample data. The weights were determined primarily from the number of full-time first-year graduate students reported by the U.S. Office of Education for each of the participating institutions (4).

The score frequencies for a particular field and institution were adjusted for (a) the size of the institution's class of full-time first-year graduate students, (b) the number of full-time first-year graduate students in the size category (large, medium-sized, small) in which the institution was classified, and (c) the number of CGS schools in that particular size category. (The actual formula used in computing the weights is given in Appendix C.)

Since the score data for the fields of business, education, and physical education were probably biased (see next section), neither

Aptitude Test nor Advanced Test score data are reported for these fields. Aptitude Test data for these fields were, however, included in the distributions for "all fields." It was thought that any bias existing in the data for the three fields would not have a biasing effect on the overall Aptitude Test distributions.

Table 1

PERCENT OF GRADUATE STUDENTS SCORING LOWER THAN SELECTED SCALED SCORES ON THE VERBAL SECTION OF THE APTITUDE TEST

Scaled Scores	Biology	Chemistry	Economics	Engineering	French	Geology	Government	History	Literature in English	Mathematics	Philosophy	Physics	Psychology	Sociology	Spanish	All Fields
800					97					99	99	99	99	99		99
780	99	99			97		99	99	98	98	96	96	98	98		98
760	98	98	99		94	99	96	97	96	96	89	89	95	97		95
740	98	97	96	99	91	98	91	94	90	94	83	81	92	96		94
720	97	88	89	96	86	97	86	91	82	92	75	79	89	94	97	92
700	95	88	83	92	83	92	80	87	73	88	67	73	80	85	97	86
680	91	85	75	88	76	82	76	80	68	82	51	67	73	81	96	81
660	88	79	71	83	66	76	70	70	58	79	41	58	65	77	93	77
640	82	71	65	81	61	71	63	64	48	70	35	54	59	74	90	73
620	77	62	61	74	39	65	55	58	42	65	30	46	51	65	62	68
600	69	56	54	68	35	58	49	51	34	56	22	37	43	58	56	62
580	64	49	48	63	31	55	43	44	31	52	17	31	36	52	55	58
560	58	41	40	52	27	48	35	34	21	46	14	26	31	48	52	52
540	56	38	35	43	24	40	32	28	13	42	11	21	25	41	51	48
520	47	27	27	34	22	35	27	23	9	35	9	17	16	37	39	42
500	40	24	23	30	14	26	16	18	8	28	6	14	11	31	34	37
480	36	22	19	28	11	22	14	12	6	21	5	11	5	27	23	31
460	27	16	13	24	8	20	13	11	5	19	4	9	2	23	14	26
440	20	11	7	20	7	16	12	10	3	13	3	4	2	20	14	21
420	16	9	5	15	5	13	8	7	2	12	2	1	2	19	14	16
400	14	8	3	12	4	11	6	7	1	10	1			18	11	11
380	14	7	2	9	3	8	6	6		10				15	8	8
360	10	6	1	7	2	7	5	1		6				11	2	6
340	9	4		3	1	5	4			3				10	2	4
320	9	3		3			3			3				7	2	2
300	9	3		2			2			3				4		1
280	6	3		2			2			2				2		
260	5	2		1			1			2				1		
240	3	2								1						
220	3	2														
Mean	518	566	581	539	608	556	586	587	626	559	652	622	609	546	542	547
Standard Deviation	128	117	104	110	105	112	117	103	93	120	90	103	89	134	96	124
Number of Graduate Students	163	280	260	175	146	126	212	259	237	289	228	233	258	251	77	3812

Table 2

PERCENT OF GRADUATE STUDENTS SCORING LOWER THAN SELECTED SCALED SCORES ON THE QUANTITATIVE SECTION OF THE APTITUDE TEST

Scaled Scores	Biology	Chemistry	Economics	Engineering	French	Geology	Government	History	Literature in English	Mathematics	Philosophy	Physics	Psychology	Sociology	Spanish	All Fields
900			99							98						
880			98							98						
860			98	98						98	98					
840		99	98	98		99	99			98	97	99				
820		97	98	96		98	98			96	96	93		99		99
800	98	96	94	94		97	98			89	95	87	98	98		98
780	97	92	92	88		94	96	99	99	83	92	68	95	97		96
760	96	88	89	79	99	92	95	98	98	78	89	56	93	96		93
740	94	79	82	69	97	83	95	98	98	65	85	44	89	96		90
720	92	67	76	58	96	78	93	96	97	54	82	36	86	92		86
700	90	60	71	44	94	66	90	95	94	48	76	24	79	90		82
680	88	56	65	39	93	63	88	94	93	43	71	19	75	88		77
660	79	43	58	32	90	54	85	91	92	38	66	16	71	85	99	73
640	74	33	51	24	87	44	81	88	88	32	60	13	64	80	98	68
620	72	28	44	18	85	36	76	83	84	24	55	10	61	75	98	64
600	67	27	37	13	84	33	74	80	80	16	48	5	52	72	98	61
580	64	22	32	11	82	26	70	75	74	10	35	2	43	69	96	55
560	57	18	24	9	79	22	68	67	71	9	28	1	42	65	96	51
540	44	14	20	4	75	18	62	58	61	8	23		37	54	95	45
520	38	9	16	4	68	11	56	53	55	7	20		28	47	88	40
500	30	6	14	2	65	10	53	52	48	5	18		23	43	62	36
480	26	5	12	2	60	6	44	45	42	4	12		17	39	59	31
460	19	5	11	1	54	3	34	36	34	3	8		12	32	55	26
44	18	4	9		44	2	25	28	25	3	7		9	29	49	22
420	17	4	6		20	2	16	23	18	3	6		6	26	35	18
400	12	3	4		10	2	14	20	17	3	3		4	22	25	13
380	11	3	2		5	2	13	16	12	3	3		1	20	17	10
360	9	2	1		4		10	8	10	1	2			17	10	7
340	7	2			4		8	6	7	1	2			16	9	6
320	6	2			3		7	2	4	1	1			15	9	6
300	4	2			2		6	2	1					9	2	4
280	2	2			1		5							4	1	2
260	2	2					3							2		2
Mean	543	652	624	688	486	637	513	502	504	681	608	730	587	510	446	553
Standard Deviation	123	110	116	83	105	98	129	110	109	105	117	69	111	142	77	137
Number of Graduate Students	163	280	260	175	146	126	212	259	237	289	228	233	258	251	77	3812

Table 3

PERCENT OF GRADUATE STUDENTS SCORING LOWER THAN SELECTED SCALED SCORES ON THE ADVANCED TESTS

Scaled Scores	Biology	Chemistry	Economics	Engineering	French	Geology	Government	History	Literature in English	Mathematics	Philosophy	Physics	Psychology	Sociology	Spanish
950										93	97	98			
940										93	96	96			
920										92	96	95			
900										91	93	94			
880	99	99	99			97				89	91	92			
860	97	98	98			97				86	91	90			
840	96	96	98	99		96				85	88	90			
820	95	95	94	98		91				81	85	86		99	
800	94	94	88	94		90				79	83	82		97	
780	90	88	84	93	98	87		97	99	74	77	78	99	96	99
760	89	84	74	90	98	84		96	96	67	64	74	98	91	84
740	81	79	70	81	97	69	99	95	94	64	56	64	95	90	84
720	65	73	66	72	96	65	96	93	91	63	50	63	94	88	83
700	55	69	57	64	94	59	88	90	83	60	35	58	91	86	81
680	54	56	49	58	87	53	87	85	76	59	30	46	82	78	80
660	52	48	43	50	80	44	78	82	68	55	26	43	70	70	76
640	44	42	34	44	60	37	71	65	62	50	23	40	66	69	65
620	41	40	29	37	48	34	65	60	56	42	18	37	53	62	61
600	36	30	23	33	37	30	58	54	43	40	12	33	45	51	58
580	34	22	22	22	32	27	48	48	34	38	12	29	37	43	54
560	31	17	15	19	25	14	36	38	22	36	10	27	28	31	49
540	29	12	10	12	19	8	31	29	20	34	6	22	20	28	38
520	22	11	9	11	11	4	24	23	13	31	2	15	15	24	23
500	19	9	5	4	10	2	18	15	11	21	2	14	11	23	20
480	15	8	3	2	8	2	12	14	7	19	1	7	7	20	19
460	3	6	2		8	1	9	8	6	16		5	4	15	16
440	2	6			4		8	1	2	9		4	3	9	13
420	2	5			4		6			3		1	2	8	4
400	2	2			4		6			3				8	1
380	1	2			4		6			3				6	
360														3	
340														1	
Mean	636	647	670	648	600	666	575	586	609	648	715	669	601	585	582
Standard Deviation	119	110	101	92	83	100	91	88	85	166	106	137	80	114	110
Number of Graduate Students	129	268	234	159	152	99	164	232	232	265	188	227	222	187	82

ACCURACY OF THE DATA

How accurate are the data reported in Tables 1-3? One way to answer this question is to determine confidence intervals for the various means of the score distributions. However, such a procedure can be used legitimately only if the sampling is random. Since there is reason to believe that the final samples were not random, this procedure was not considered appropriate. Another way to approach the question of accuracy is to examine (a) the representativeness of the original sample and (b) the number of students in the original sample with appropriate GRE scores.

The samples in three fields were considered unrepresentative because there were insufficient numbers of students in the samples from particular graduate schools. For example, because of a communication problem, no students from the University of Michigan were represented in the sample for education, even though a large number of first-year graduate students were enrolled in this field at the University of Michigan in the fall of 1964. Thus, the sample for education could not be considered representative. The other fields which were judged to have biased data because of inadequate representation from some colleges or universities were business, physical education, and "other".

The samples in some fields were also considered unrepresentative because of ambiguity in the definition of subpopulations. Since graduate

school personnel should be more able than anyone else to determine the subject-matter areas for which a given Advanced Test is appropriate, the colleges and universities that selected their own samples were asked to define the subpopulations for the various fields. Educational Testing Service defined the subpopulations when it selected the samples. (Subject-matter areas included under a particular major field heading when ETS selected the samples are indicated in Appendix D.) As a result, certain ambiguities arose. The fields most seriously affected were probably biology, education, and "other".

Even if samples of students are representative, the data might still be biased if appropriate test scores are not available for all of these students. In this study, not all of the students in the original sample had scores. Students at 17 institutions were not offered special testings, and only about 30% of the students asked to participate in the special testings offered by the other 35 institutions actually were tested. The number and the percent of students in the original sample for this study who had Advanced Test or Aptitude Test scores are reported in Table 4. The percent of students who had appropriate test scores ranged from 9% (in business) to 66% (in physics) for the Advanced Tests, and from 21% (in business) to 73% (in psychology) for the Aptitude Test. Because the percentages of students with GRE scores were so low, the Advanced Test distributions in the fields of business, education, and physical education and the Aptitude Test distributions in the field of business were probably biased.

Another way to approach the question of accuracy is to compare the distributions with data for other groups. Two such groups are the

Table 4

NUMBER AND PERCENTAGE OF STUDENTS IN A PARTICULAR SAMPLE WHO HAD ADVANCED TEST OR APTITUDE TEST SCORES

Major Field	Number in Sample	Students with Advanced Test Scores		Students with Aptitude Test Scores	
		Number	%	Number	%
Biology	243	129	53	163	67
Business	332	31	9	69	21
Chemistry	458	268	59	280	61
Economics	445	234	53	260	58
Education	353	69	20	116	33
Engineering	348	159	46	175	50
French	397	152	38	146	37
Geology	202	99	49	126	62
Government	470	164	35	212	45
History	505	232	46	259	51
Literature in English	469	232	49	237	51
Mathematics	506	265	52	289	57
Philosophy	436	188	43	228	52
Physical Education	149	36	24	55	37
Physics	346	227	66	233	67
Psychology	355	222	63	258	73
Sociology	555	187	34	251	45
Spanish	251	82	33	77	31
Other	1044	--	--	378	36

GRE basic reference groups of college seniors (1) and 1963-64 GRE National Program Candidates (2). In general, the means for the Aptitude Test and the Advanced Tests from the current study were somewhat larger than those reported in the 1963-64 study and much larger than the means for the college seniors. The Verbal Ability and Quantitative Ability means of first-year graduate students were approximately 15 points higher than the corresponding means of the 1963-64 National Program candidates. The Verbal Ability mean for first-year graduate students was, on the average, 55 points higher than the corresponding mean of college seniors, while the Quantitative Ability mean was about 75 points higher. The Advanced Test scores of first-year graduate students averaged about 25 points higher than the scores of National Program candidates and about 100 points higher than the scores of college seniors. However, the means for first-year graduate students were slightly lower than the means for National Program candidates in biology (Verbal Ability mean), government (Quantitative Ability mean) and mathematics (Advanced Test mean).

A third comparison group is the 1964-67 norms group, who also were National Program candidates (see the Handbook for the Interpretation of GRE Scores, 1967-68). No data by major field are available on the 1964-67 group for the Aptitude Test. However, the overall Verbal Ability and Quantitative Ability means for first-year graduate students were approximately 25 points higher than the means for the 1964-67 norms group. The Advanced Test means for first-year graduate students in all fields but mathematics were also higher than the means for the 1964-67 group. In mathematics the mean for the norms group slightly exceeded the mean for first-year graduate students. In the other fields, the means of first-year

graduate students ranged from 23 points higher in biology to 58 points higher in geology.

Generally, these findings seem reasonable. Most of the persons who took the GRE tests in the National Program intended to go to graduate school or in some cases were already enrolled. However, a number of these persons were probably not admitted to CGS member schools, and others failed to attend any graduate school. Thus, one would expect the scores of the National Program candidates to be lower on the average than the scores of enrolled first-year graduate students. Likewise one would expect the scores of enrolled first-year graduate students to be substantially higher on the average than the scores of complete classes of college seniors, not all of whom actually attend graduate school.

That the means for first-year graduate students were lower than the means for National Program candidates in biology and government on the Aptitude Test and in mathematics on the Advanced Tests is somewhat disturbing. It might be that the means for first-year graduate students in these fields were low. However, a large percentage of the National Program candidates were applicants for National Science Foundation (NSF) fellowships. Each applicant was required to take the Aptitude Test and an Advanced Test if one was offered in his field. Advanced Tests were offered in biology, chemistry, economics, engineering, geology, government, mathematics, physics, psychology, and sociology. The percent of applicants for NSF fellowships in the 1964-67 norms group was particularly high in chemistry (26%), mathematics (25%), physics (23%), and geology (20%), respectively. Thus, the Advanced Test means for these four fields especially and the Aptitude Test means for the 1964-67 norms

group were somewhat inflated. If one removed the effect associated with the percentage and caliber of NSF fellowship applicants, the means for first-year graduate students would probably have been consistently higher than the means for National Program candidates.

In summary, then, the Aptitude and Advanced Test data for the fields of business, education, and physical education and the Aptitude Test data for "other" fields were probably biased and are not reported. However, the data for the other fields appear to be reasonably consistent with comparative data from other sources, particularly when the percentages and caliber of NSF fellowship applicants are considered. The reported data are probably fairly accurate estimates of the performance of full-time first-year graduate students who attended colleges or universities belonging to CGS in the fall of 1964.

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APPENDICES

Appendix A

COLLEGES AND UNIVERSITIES WHICH PARTICIPATED IN THE GRE STUDY OF FIRST-YEAR GRADUATE STUDENTS

Large Colleges or Universities	Medium-Sized Colleges or Universities	Small Colleges or Universities
Boston University	Alabama, University of	Akron, University of
California, University of (Berkeley)	Arkansas, University of	Atlanta University
California, University of (Los Angeles)	Cincinnati, University of	California Institute of Technology
Chicago, University of	Colorado, University of	California, University of (Santa Barbara)
Columbia University	Johns Hopkins University	Dartmouth College
Harvard University	Kent State University	Duke University
Illinois, University of	Miami University (Ohio)	Jefferson Medical College of Philadelphia
Iowa, University of	Nebraska, University of	Louisville, University of
Massachusetts Institute of Technology	Oklahoma State University	Maine, University of
Michigan State University	Olkahoma, University of	Miami, University of (Florida)
Michigan, University of	Princeton University	New York, State University of (Albany)
Minnesota, University of	Southern Illinois University	Tuskegee Institute
Missouri, University of	Western Michigan University	Utah State University
New York University		Virginia Polytechnic Institute
Northwestern University		Washington State University
Ohio State University		
Pennsylvania State University		
Pennsylvania, University of		
Purdue University		
Stanford University		
Syracuse University		
Washington, University of		
Wisconsin, University of		

Appendix B

PLAN OF DATA COLLECTION

I. Identification of students to be included in the sample

A. Major fields to be sampled. In the Graduate Record Examinations National Program for Graduate School Selection, the Aptitude Test and eighteen Advanced Tests are administered. It is planned to obtain Advanced Test norms on first-year graduate students enrolled in the corresponding major fields. Aptitude Test norms will be obtained on the basis of a cross section of all first-year graduate students. In order to provide Aptitude Test norms it is necessary to obtain score data on the Aptitude Test for students enrolled in other fields as well as for students enrolled in the eighteen major fields. In addition, it is planned to provide Aptitude Test norms on students enrolled in each major field. The major fields to be sampled are listed in the table in Section I-C.

B. Sampling ratios for the major fields. The number of cases needed in the sample to represent the population of each major field adequately is approximately 300. Since more students are enrolled in some fields than in others, it is desirable to use different sampling ratios for the different major fields to obtain adequate samples. Thus for a field with a large enrollment, such as engineering, a smaller proportion of the total enrollment would need to be selected than for a field with a smaller enrollment. In the case of a field with a very small enrollment every student may have to be selected. To adjust for differences in enrollment in the major fields the sampling ratios given in the table in Section I-C have been chosen.

C. Procedure for the selection of an unbiased sample. It is essential that the sampling within each major field be as nearly random as possible in order not to bias the norms. The following procedures are designed to produce an unbiased sample.

1. The population to be sampled consists of all students entering graduate school in the fall of 1964. Since sampling ratios differ from field to field (see table on following page), the total population of students must be identified according to the eighteen major fields designated in the table. All of the names of the students in major fields not specifically designated in the table should be listed on a combined roster and identified by

major field. Although a single roster is to be used for major fields not listed in the table, the major field with which each student is affiliated should still be indicated.

2. Within each of the eighteen fields named in the table and within the combined category, each student should be assigned a number from 1 to N (where N equals the total number of students enrolled in the field or in the combined category).

3. In the actual selection of the students for a major field sample, the first student to be selected will be the one whose number corresponds to the initial selection number given in the table. Then the following cases to be selected will be determined by the sampling ratio for that major field. Of course in the case of a sampling ratio of 1/1, all cases would be included in the sample. For example, if at institution A there were 100 graduate students enrolled in the History Department in the fall of 1964, these students would be listed on a roster and assigned consecutive numbers. In accordance with the initial selection number in the table, the first student to be selected would be student No. 2; and in accordance with the sampling ratio for History (1/3), every third student thereafter, i.e., students numbered 5, 8, 11, etc., would be selected until the entire list of students in the field was exhausted.

Sampling Ratios and Initial Selection Numbers for Major Fields

Major Field	Sampling Ratio	Initial Selection No.	Major Field	Sampling Ratio	Initial Selection No.
Biology	1/5	1	Literature	1/5	1
Business	1/10	1	Mathematics	1/3	2
Chemistry	1/3	2	Philosophy	1/1	1
Economics	1/2	1	Physical Education	1/2	1
Education	1/10	1	Physics	1/3	2
Engineering	1/10	1	Psychology	1/3	2
French	1/1	1	Sociology	1/1	1
Geology	1/1	1	Spanish	1/1	1
Government	1/2	1	Major Fields Not Listed	1/10	1
History	1/3	2			

D. Preparation and mailing of the rosters. On the enclosed rosters the names of the students selected for the samples should be listed according to major fields. If GRE scores are readily available on the students, they should be recorded in Columns 4-6 on the rosters.

For a student who has one or more missing GRE scores, the name of the undergraduate college he last attended should be given; and his date of birth should be provided if it is readily available. When the rosters are completed, they are to be sent to:

Dr. Philip R. Harvey
Assistant Program Director
Graduate Record Examinations
Educational Testing Service
Princeton, New Jersey

II. Special test administration for securing missing data on students in the sample

The students in the sample for whom GRE scores are available will not need to be tested. ETS will search the files for the scores of those students whose scores are not furnished by the cooperating institutions. Students for whom the Advanced Test score and/or the Aptitude Test scores are missing will be requested to take the test(s) for which scores are not available. ETS will report to each cooperating institution the names of students to be tested, and a test date will be arranged for the institution. Examination materials and instructions for testing will be provided by ETS.

Appendix C

WEIGHTS USED IN PREPARING THE FREQUENCY DISTRIBUTIONS

The weight for a college or university i in a given field was computed as follows:

$$W_i = \frac{N_i}{F_i} \times \frac{N}{N'} \times R \qquad (F_i \neq 0)$$

where N_i = The number of full-time first year graduate students at college or university i in the sample;

F_i = the number in the sample who had the appropriate GRE score;

N = ΣN_i for all colleges or universities in the same size category as college or university i;

N' = ΣN_i $(F_i \neq 0)$ for all colleges or universities in the same size category as college or university i;

R = the weight based on the sampling ratio in the appropriate size category (1 for large colleges or universities, 4 for medium-sized colleges or universities, and 138/15 for small colleges or universities).

To see how this weighting scheme worked, consider the following example for the field of Biology:

Size Category	College or University ID No.	N	F	W
Large	1	21	0	--
(R=1)	3	48	4	15.5
	30	24	2	15.5
Medium-Sized	31	21	3	28.0
(R=4)	32	0	0	--
	45	19	1	76.0
Small	48	18	4	41.4
(R=138/15)	49	8	6	12.27
	60	9	1	82.8

In this example the weights for colleges or universities 3, 31, and 49 in Biology were computed as follows:

$$\text{No. 3: } \frac{48}{4} \times \frac{93}{72} \times 1 = 15.5$$

$$\text{No. 31: } \frac{21}{3} \times \frac{40}{40} \times 4 = 28.0$$

$$\text{No. 49: } \frac{8}{6} \times \frac{35}{35} \times \frac{138}{15} = 12.27$$

For both the Aptitude Test and the Advanced Tests, the frequencies were weighted according to the weights calculated by the formula given previously. However, for the Aptitude Test frequencies were combined across fields to give overall distributions for Verbal Ability and Quantitative Ability as well as distributions for each of the major fields.

Appendix D

SPECIFIC FIELDS CLASSIFIED UNDER PARTICULAR MAJOR FIELDS FOR SAMPLING PURPOSES

Biology:	Biology, General Botany Zoology
Business:	Accounting Business Administration Business and Commerce
Chemistry:	Chemistry (including Analytical, Inorganic, Organic, and Physical Chemistry)
Economics:	Economics
Education:	Administration Counseling and Guidance Early Childhood Education Education, General Educational Psychology Elementary Education History and Philosophy of Education Secondary Education
Engineering:	Aeronautical Chemical Civil Electrical Engineering, General Industrial Mechanical
French:	French
Geology:	Geology
Government:	Government Political Science
History:	American History European History History, General
Literature:	Comparative Literature English Literature
Mathematics:	Mathematics Statistics
Philosophy:	Philosophy
Physical Education:	Physical Education
Physics:	Chemical Physics Physics
Psychology:	Psychology (including Clinical Psychology and Social Psychology)
Sociology:	Sociology
Spanish:	Spanish